THE PRESERVATION OF NON-BIOLOGICAL ENVIRONMENTS IN THE SOLAR SYSTEM. E. C. Hargrove[1], [1]Center for Environmental Philosophy, Department of Philosophy and Religion Studies, P.O. Box 310980, University of North Texas, Denton, TX 76203-0980; hargrove@unt.edu.

Introduction: The preservation of non-biological environments in the Solar System will likely follow the path of nature preservation in the West in the modern period. In the Middle Ages, educated Europeans were taught that nature was not beautiful. Gradually, Europeans came to admire nature and this admiration led to nature preservation. These developments took place within a number of fields: landscape gardening, landscape painting, nature poetry and prose, nature photography, and natural history science (geology, biology, and botany). Nature aesthetics had a scientific orientation in that scientifically interesting landscapes also produced aesthetic experiences. Such aesthetic appreciation, especially of geological formations, led directly to nature preservation even without direct visitation. Most landscapes painted by major artists in the nineteenth century are now national parks or national monuments [1].

The Hartmann Hypothesis: W. Hartmann [2] has argued that the space societies supporting space exploration may eventually break into two opposing groups comparable to the split between the conservations and the preservations at the beginning of the twentieth century. One group will hold that utilization of off-planet resources will reduce resource exploitation on Earth, thereby achieving optimal environmental goals on this planet. The other group will argue that such off-planet utilization is simply a continuation of the untempered exploitation that has already taken place on Earth. The contested areas will be aesthetically interesting landscapes. The Sierra Club, which was originally an advocacy group for the U.S. Forest Service, exemplifies this conversion from advocacy to opposition.

Types of Landscapes: H. Rolston [3] has offered some guidance in preserving non-biological extraterrestrial environments: (1) respect places spontaneously worthy of a proper name; (2) respect exotic extremes in nature; (3) respect places of historical value; (4) respect places of active and potential creativity; (5) respect places of aesthetic value; and (6) respect places of transformative value. Mare Tranquillitatis might fall under (1) or (3); geysers on Io or Titan under (2) or (6); places that remind us of the natural beauty on Earth under (5); and places that cause us to have new insights into ourselves or Earth under (6).

Aesthetic Progression: Nature aesthetics began with an aesthetic appreciation of mountains, which were considered sublime in contrast to art objects, which were considered beautiful [4]. Eventually an aesthetic category between the sublime and the beautiful was established called the picturesquely beautiful, modeled on the paintings of Claude Lorrain. Europeans came to admire the aesthetic qualities in real landscapes that they first perceived in paintings. Because it was difficult to aesthetically appreciate natural form, the first natural objects to be appreciated were objects that reminded viewers of human artifacts: primarily castellated rocks, objects that look like castles or ruins. Such objects humanized the landscapes. Today cave tours typically highlight cave formations that remind tourists of human-related objects: hats, trousers, fish, and other animals. The Face on Mars, like the Mountain of the Holy Cross in Colorado, is of this kind. The appreciation of natural form requires experience, thought, and sometimes training before appropriate standards for aesthetic appreciation can be developed. The landscapes of the Upper Missouri River and the deserts of the western United States were especially difficult to aesthetically appreciate and will likely provide a good starting point for the appreciation of non-biological environments in the Solar System. As Armstrong put it minutes after standing on the Moon, echoing early explorers in the western U.S., "[The Moon] has a stark beauty all its own. It's much like the high desert of the United States. It's different, but it's very pretty out here." We do not yet have the ability to distinguish a beautiful crater on the Moon from an average or inferior one, but as craters are regularly photographed in the future, this ability will become fine-tuned and interest in preserving some of them will develop. Some places may be worthy of preservation because of the views they provide or because of unusual light displays that occur there on a regular basis.

Practical Matters: There are a number of steps that NASA can take to avoid the Hartmann scenario. NASA should plan on setting aside the Apollo landing

sites as protected areas on historical grounds. Extreme caution should be taken in approaching these sites since adding to the footprints at these sites may come to be considered vandalism. Likewise, NASA employees should avoid writing their names on natural formations that they encounter. Extreme care should be taken in mining on the Moon to ensure that the surface of the Moon is not visibly altered from the perspective of viewers on Earth. If strip mining is undertaken on the Moon, efforts should be made to restore those areas to a natural look if at all possible. If restoration is not possible, NASA should consider doing its mining on the backside of the Moon where it is less likely to generate protest. Another possibility might be to use the damaged areas for new construction or as last resort to turn them into earthworks, so that they are at least considered artistic. Although earthworks on Earth are themselves controversial, they may be a better alternative to doing nothing.

The introduction of life forms into a non-biological environment should be undertaken with great caution. Generally, the introduction of a life form from one part of Earth to another is a dismal failure. However, when it is not, that success is often followed by unsuccessful attempts to undo the damaged caused. The Moon or Mars covered with some odd microbial foam would be damaging to NASA's image and would make it difficult to study the natural history of such celestial bodies, an unpleasant prospect, since such study will be a key way for NASA to maintain interest in its programs.

Ethical Issues: Because we are talking about non-biological environments, the ethical issues are not very problematic. Non-living objects in such environments do not have interests or rights and cannot be benefited or harmed. It is customary today to think in terms of use because of the emergence of pragmatism and modern economics at the beginning of the twentieth century. Most people, however, continue to value some things for their own sake, even though they cannot articulate their views very clearly and even though the "sake" is really metaphorical. This type of valuing is clearest with regard to art objects which are frequently considered to be immensely valuable even though the materials out of which they are made are themselves inconsequential from an economic perspective. The traditional way to account for this kind of valuing is to say that such objects have intrinsic value, which simply means that people value them intrinsically or "for their own sake." Not harming, defacing, or vandalizing art objects does not involve carrying out a duty to those objects, but rather a duty to the people who value those objects "for their own sake." These people value these objects the way that they do because they believe that the world is a better world if those objects continue to exist in it. This line of reasoning will likely be applied to some, but not all, extraterrestrial objects as well. Many people will come to hold that the Solar System is a better Solar System if certain extraterrestrial objects continue to exist in good (natural) condition. This line of reasoning may at first appear most reasonable when the objects are intrinsically valued because of their scientific interest, but it will also be applied to objects that are only of aesthetic interest, and the range of objects that are considered aesthetically valuable will continue to expand as aesthetic standards for extraterrestrial objects are fine-tuned. NASA will contribute to this expansion by providing the general public with ever more scientifically and aesthetically interesting information and images.

The aesthetic (and scientific) appreciation of non-biological environments will not prevent NASA from using these environments, but it will place limits on how and what can be done. As on Earth, the public will accept a broad range of uses of these environments as long as the manner in which that use is carried out does not come to be considered wanton or negligent. As an architect in Georgia who specialized in housing developments after World War II once put it, it usually does not cost more to do something right than to do it wrong. It fact, often it is cheaper when one takes into account the cost of repairing the damage done. With careful planning nearly all NASA projects should be achievable without triggering the Hartmann scenario and without significant increases in cost.

If biological entities are encountered, they will most likely be microbial. Because environmental ethics places more value on the species than the individual, the chief concern with regard to microbial extraterrestrial life will be preventing species extermination. If terrestrial life forms are introduced into the non-biological environment, the concern may switch to concern about unnecessary suffering, moving away from environmental ethics to animal welfare ethics. Since organisms from Earth will be considered exotics, species extermination will not be an issue. Nor will unnecessary suffering unless there is actual and noticeable suffering to higher organisms.

References: [1] Hargrove, E. C. (1989) *Foundations of Environmental Ethics.* [2] Hartmann, W. K., "Space Exploration and Environmental Issues" (1984) *Environmental Ethics* VI, 227-239. [3] Rolston III, H.,"The Preservation of Natural Value in the Solar System," in Hargrove, E. C. (1986) *Beyond Spaceship Earth*, 172-178. [4] "Why We Think Nature is Beautiful." http://www.cep.unt.edu/show (n.d.).

Illustration: Hartmann, W. et al. (1984) *Out of the Cradle*, 78.